Non-Provisional Patent Application of

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for

A Geothermal Loopless Exchanger

RELATED APPLICATION

This application is being filed as a corresponding application to and claims the benefit of U.S. Provisional Application No. 601429,160, filed November 27, 2002, the entire teachings of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to geothermal heating and cooling systems for providing space conditioning, including heating, cooling and humidity control. The geothermal system may also provide water heating, either to supplement or replace conventional water heaters, pool heating and cooling, and refrigeration.

2. Description of the Prior Art

The prior art is exemplified by many examples of heat reclamation systems and earth heat exchange systems, most of which are gravity flow, expensive, complicated and require periodic cleaning and maintenance in order to avoid fouling and/or degradation of heat recovery efficiency; examples of which are shown in U.S. Pat. Nos. 4,304,292; 4,300,247; 4,150,787; 4,352,391, 4,372,372 and 4,619,311. Typically such systems include conduit, conduits, and/or a pipe loop within the earth, a pond or well, apparatus for circulating heat transfer fluid there through and through other systems or apparatuses above the surface, and heat exchange apparatus for exchanging heat between the transfer fluid and an item, apparatus, device or other thing. However, as will be seen herein, there are no existing systems that are as simple, versatile and inexpensive as the instant invention.

SUMMARY OF THE INVENTION

In the present invention, the disadvantages of the prior art are overcome by using a relatively simple heat exchanger configuration in a flooded state, rather than a gravity state, and attached to a city water main, or similar forced water source, whereby the city water supply and the like flows through the heat exchanger. Said heat exchanger is comprised of an inner pipe or conduit through which the water source will flow, and is wrapped by a coiled conduit, through which the heat transfer fluid will flow.

The use of said heat exchanger in this manner is inventive because the fluids within said heat exchanger never mix with the city water supply, or the like, thereby ensuring safe operation. Further, the cost is greatly reduced due to the length of conduit needed.

Due to the simplicity of said heat exchanger design, the flooded water supply can pass through, providing an even temperature, whereas prior art heat exchangers utilize stagnant or gravity heat sources which may fluctuate in their respective heat intensities. Finally, the constant forced flow of water through the city water main, and the like, allows for a more rapid transfer of heat, or cooling, than prior art suggests.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic view of the apparatus and shows a system whereby a geothermal heat pump, or multiple pumps, is located within the building with a closed conduit loop line that has a heat exchanger within the loop line, said heat exchanger being attached to the city water main.

DETAILED DESCRIPTION OF THE DRAWING AND DESCRIPTION OF THE PREFERRED EMBODIMENT

The prior art includes many techniques for the recovery of heat energy contained primarily in waste water. As disclosed, for example, in U.S. Pat. Nos. 4,304,292; 4,300,247; 4,321,798; 4,150,787; 4,352,391, 4,372,372 and 4,619,311, water used for showering, as well as other purposes, and discharged through drain lines can be placed into a heat exchange relationship with colder feed water in order to preheat either water heater feed water and/or cold water prior to mixing with hot water to provide tepid water for direct use. (See also A.A. Field, Heating/Piping/Air Conditioning, Volume 48, No. 3, pp. 87-91, "Solar Energy: Part II, The Continent," March 1976.) Said heat exchange relationship conserves energy by lowering the temperature of said waste water by transferring heat energy to said feed water, or said cold water, or both, thereby reducing primary hot water heater input energy requirements and the quantity of hot water used in showering, for example. The present invention is directed at installations whereby the

heat source comes from a flooded source, such as city water flowing through the city water main.

Referring to FIG. 1, the geothermal heat pump 1 is contained within the building. The geothermal heat pump may be connected to a variety of apparatus to utilize the heat, or cooling, generated, such as heating or cooling air ducts, interior water lines, etc.

Still referring to FIG. 1, a closed loop line conduit 2 is attached to the geothermal heat pump 1 at two points, one being a fluid inlet 3 and the other a fluid outlet 4, the outlet 4 having attached thereto a contaminate monitor alarm and shut down switch 5 to monitor leaks and shut down the apparatus if a leak is detected. The closed loop line conduit 2 contains a fluid, such as an ecologically safe coolant or refrigerant that has a very low boiling point such that the fluid is in a gaseous state at room temperature. Two such fluids that are acceptable are R22 and R410a, although others may work equally as well.

Still referring to FIG. 1, the heat exchanger 6 is inserted as a section of the city water main 7, such that a section of the city water main 7 is cut out and replaced by the heat exchanger 6, thereby allowing the city water supply 8 to flow through the heat exchanger 6. The section where the heat exchanger 6 is attached is encased in an insulated vault 9 with a locking cover to allow restricted access into the vault 9 to service the heat exchanger 6. Within the vault 9 area, and attached to the outlet 4 of the closed loop line conduit 2, there is a first walled failure alarm 10 whereby any failure in the system at that point would be detected, thereby allowing for the shutting down of the apparatus and servicing and repair within the vault 9 area.

Referring still to FIG. 1, the heat exchanger 6 comprises a fluid intake 11, which is attached to the outlet 4 portion of the closed loop line conduit 2, and a fluid return 12, which is attached to the inlet 3 portion of the closed loop line conduit 2. A flow meter 13 is attached to the inlet 3 portion of the closed loop line conduit 2 at a location within the building and relatively close to the geothermal heat pump 1, whereby the flow of the fluid within the closed loop line conduit can be monitored. The fluid within the closed loop line conduit 2 is moved within the closed line loop conduit by a pumping means at or within the geothermal heat pump 1.

The invention, thus, allows for the flow of a refrigerant or other like fluid to flow from the geothermal heat pump 1 through the closed loop line conduit 2 to the heat exchanger 6, whereby the heat exchanger transfers the heat from the city water supply 8, or in the summer months, the cooling from the water supply 8, to the fluid, and the fluid flow returns to the geothermal heat pump 1 which transfers that heat, or cooling, to a variety of building space conditioning purposes.

The present invention is more efficient and economical than prior art in that it requires less conduit and utilizes an easily and readily available heat and cooling source, that being the city water main supply. Further, the present invention allows for the more rapid and even transfer of heat from the heat source, such as the city water supply 8, due to the flooded state of the exchanger. The flooded state also reduces the need for cleaning, as the water flows rapidly and freely through the exchanger and does not allow the buildup of residue along the inside of the heat exchanger 6.

The conduit connections are relatively simple and straight, thereby eliminating many curves and bends which may weaken the conduit. The preferred embodiment

would have the system installed below grade level, however other installations, such as above ground level, could also be used simply by inserting an elbow down joint in both the inlet 3 and outlet 4 portions of the closed loop line conduit 2 near the geothermal heat pump 1 and within the building, so that the closed loop line conduit 2 thereby exits the building below grade.

The present invention also differs from prior art in that it utilizes a flooded state heat exchanger rather than a gravity flow exchanger as described in prior art. Thus, the present invention can be utilized with any flooded or forced water source, such a natural spring, well or river. Further, other embodiments of the present invention can be used in a lake or pond, or other still water source, with the addition of a pump to force the water through the exchanger. The present invention can also be easily adapted to work with a solar heat source system, wherein the heat exchanger 6 would be situated such that the fluid heated by solar energy would be pumped through the heat exchanger 6, and thus allow for the transfer of heat from the solar heated fluid to the fluid contained within the closed line loop conduit 2.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is understood that the invention is not limited to this precise form of apparatus and that changes may be made therein without departing from the scope of this invention.